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Proceedings of the Regional Advisory Process on the 2008 Assessment of Eastern Nova Scotia Snow Crab

Mic Mac Amateur Aquatic Club
Dartmouth, Nova Scotia

26-27 February 2008

Tana Worcester
Meeting Chair

Compte rendu de la réunion du Processus consultatif régional au sujet de l'évaluation du crabe des neiges de l'est de la Nouvelle-Écosse pour 2008

Mic Mac Amateur Aquatic Club
Dartmouth (Nouvelle-Écosse)

Les 26 et 27 février 2008

Tana Worcester
Présidente de la réunion

Bedford Institute of Oceanography
1 Challenger Drive, P.O. Box 1006
Dartmouth, Nova Scotia
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June 2010 | **Juin 2010**

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made at the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A Regional Advisory Process (RAP) on the assessment of snow crab stocks in the Maritimes Region was held on 26-27 February 2008. Participation in this meeting included Fisheries and Oceans Canada (DFO), industry, provincial government representatives, and First Nations communities. The results of this meeting will be used to support management decisions related to the 2009 fishery.

SOMMAIRE

Une réunion d'évaluation des stocks de crabe des neiges de la Région des Maritimes a eu lieu dans le cadre du Processus consultatif régional (PCR) les 26 et 27 février 2008. Y participaient des fonctionnaires de Pêches et Océans Canada (le MPO), des représentants de l'industrie ainsi que des communautés des Premières nations, et des fonctionnaires provinciaux. Les résultats de la réunion éclaireront les décisions au sujet de la gestion de la pêche de 2009.

INTRODUCTION

The Chair of the meeting, T. Worcester, welcomed everyone and thanked them for coming to the 2008 assessment of snow crab in the Maritimes Region. Participants introduced themselves (Appendix 1), and the 2 scientific reviewers (Peter Koeller and Dale Roddick) were identified, both from DFO Maritimes Science. The purpose of the meeting was to conduct a scientific peer-review of the information presented. Participants were encouraged to contribute to the review and to ask pertinent questions; however, it was noted that discussion of management issues would be limited. In addition to the technical review of the material, this meeting was also intended to provide management advice through the development of a Science Advisory Report. Efforts would be made to work toward majority agreement on the main conclusions of the report, based on the science information available.

Assessment science is evolving within DFO. Efforts are underway to take an increasingly ecosystem-based and integrated approach to fisheries management. This means that DFO considers more than just the effects of fishing on the target stock. While there are many examples of this across the country, there is as yet no single template to be applied. This assessment is one approach to an integrated and ecosystem-based assessment focussing on snow crab. It is:

- Integrated: having combined 4X, N-ENS and S-ENS snow crab, with mention of other activities, such as oil and gas.
- Ecosystem-based: taking into account the effect of fisheries on the environment, including target and non-target populations, as well as the environment on the fishery.

Moving towards the precautionary approach may require development of reference points and harvest control rules, which can aid in evaluating progress in relation to clearly stated management objectives.

The Terms of Reference for the meeting were reviewed (Appendix 2), including the objectives of this meeting, which were to:

- Assess status using: abundance, recruitment, and exploitation rate.
- Report on commercial catch rates compared to previous years, and abundance of female crab in the survey.
- Consequences of different harvest levels on abundance and exploitation rate.
- By-catch of other species from the past 3 seasons.

In order to address these objectives, a working paper has been prepared. If the working paper was accepted, then it would be produced as a Research Documents. This proceedings was produced to document the meeting discussion.

The Agenda (Appendix 3) was reviewed, and nothing further was added.

OCEANOGRAPHIC CONTEXT

Presenter: Dave Brickman
Rapporteur: Penny Kuhn

Presentation Highlights

A generalized description of ocean currents on the Scotian Shelf was presented. It was noted that the N-ENS was generally colder than the S-ENS, and it was also colder inshore, due in part to these current patterns. In 2008, the North Atlantic Oscillation index was high (cold) compared to the long-term average. Air temperature was out of phase in the spring but was close to climatology in the annual average. Wind stress was slightly above the norm – generally more northerly. It was noted that this might be important in terms of larval drift, i.e., relationship to wind direction (northerly vs. southerly). There was generally less ice this year. In terms of bottom temperature, there was indication of a cold water incursion based on the July bottom temperature anomalies. Surface temperatures appear to have been warmer in the north and colder in the south compared to last year. There may be greater stratification. This means that in 2008, it was generally warmer at the surface and colder at bottom in ENS.

In terms of a catch/temperature relationship, snow crab in 2007 were generally caught in colder water than in 2006. This ended a previous trend. Snow crabs seem to be found in the most common temperatures, even though the most common temperature may change from year to year.

Results from the mini-log temperature sensor program were reported. 2008 was the second year of this program. 19 mini-logs were returned -- 16 with data. The intent is to compare the temperatures from these sensors to the long-term climatology. Analysis to date has indicated no obvious geographic pattern in the results.

Reviewer's Comments

A good overview was provided; however, it was missing some indication of the change in surface currents. Is there are index of water transport, such as transport from the Gulf of St. Lawrence, related to larval movement that might be available? It was explained that there was a plan to model currents in the oceanography program, as Joel Chasse does for the Gulf Region. It was hoped that come progress could be commented on next year.

The greatest increase in temperature seems to be in November/December in the shrimp holes. Would it be possible to use the summer surface temperature to predict the magnitude of this fall change? It was suggested that it might be possible to compare the fall temperatures to the long-term climatology, but this would not be predictive.

General Discussion

It was noted that there was no working paper available on this topic, but one was encouraged for next year. It was also suggested that this type of information would be useful to be able to access on the internet.

It was asked whether it might be possible to have an index of cumulative temperatures, such as the number of days at a certain temperature, rather than a snapshot of temperatures. However,

the data is not available across the Scotian Shelf at present to provide this type of analysis, as data is only collected in the summer and fall. Sampling just off Halifax is more intensive.

Someone asked whether the data from the mini-log temperature recorders could be compared to last year's results. If people fished in the same areas, it might be possible. This was a recommendation for next year. Also, some analysis should be conducted on the salinity and conductivity information that is collected by the Fishermen's and Scientists Research Society (FSRS) recorders. There was some interest in how salinity affected snow crab habitat.

ASSESSMENT OF SNOW CRAB

The Fishery

Working Paper: Integrated Assessment of the Snow Crab Resident on the Scotian Shelf in 2007. CSA Working Paper 2008/03.

Presenter: B. Zisserson
Rapporteur: P. Kuhn / T. Worcester

Presentation Highlights

Landings and catch rates were presented. Catch rates were starting to return to previous levels in the past year, but there were generally still lower than in 2004. Catch rates were lower than 2006 in N-ENS, and higher than 2006 in CFA 23, 24. Effort appears to have shifted offshore. This was particularly true in N-ENS. Observer coverage in 2008 was lower than intended. In 4X, there was limited catch of white crab -- only 1 white crab was observed due to the different season. In N-ENS, 11% of the catch was discarded as soft crab. In CFA 23 and 24, 6-8% was discarded.

Reviewer's Comments

There was some interest in any interaction that might exist between crab and shrimp fisheries in space and time. It was indicated that quantifying those interactions could be of value, as well as how seismic interactions come into play.

There was interest in whether or not tagging movement had been correlated to temperature. It had not and would have to be done with a separate source, which is not straight forward. It was noted how tagging is done opportunistically during surveys. There was a request to have more tagging on the inner shelf to be able to track movement into Area 23.

It was also noted how handling mortality (20-30%) has been determined by controlled cage releases, which is not very realistic. In general, this is difficult to quantify.

General Discussion

There was discussion about starting the season earlier in order to avoid catching soft shells, and a suggestion to do some surveying in spring/summer to see what the levels of soft shell crab are. There was some concern expressed about how changing the timing of the season might affect the mating season.

There was also some discussion of whether there are many soft shell crab on the slope, as not many were seen during the survey.

The Joint Project Agreement (JPA)

Presenter: T. McIntyre
Rapporteur: P. Kuhn / T. Worcester

Presentation Highlights

At present, there is 100% contribution to the JPA in CFA 23, 87% in CFA 24, 33% (3 of 9) in 4X , and only 8% in Areas 20-22 (6 of 78). DFO is still doing some calls to remind people who said they would contribute. Current participants will be called for this year to extend existing JPAs.

General Discussion

There was discussion about a need for greater information (from fish harvesters) regarding where the funds go. There were several questions about how the 'system' works and whether the money from industry is really required. It was suggested that there should be more discussion at advisory meeting about the JPAs. There was a request to find out who hadn't paid, but this was not possible. It was noted that the agreement was established with the expectation that everyone would contribute something. It was noted that there will be a meeting with 4X shortly after this meeting, in early March, to discuss the JPA, and it was felt that more than 1 person would be contributing this year. Other possible ways to encourage people to contribute were discussed. This was compared to requirements for submission of logbooks.

2007 Snow Crab Survey

Working Paper: Integrated Assessment of the Snow Crab Resident on the Scotian Shelf in 2007. CSA Working Paper 2008/03.

Presenter: B. Zisserson
Rapporteur: P. Kuhn

Presentation Highlights

This year the survey was conducted between 6 September and 25 November. 378 stations were conducted, which is the same scale as in 2006. It was a good year for catching rocks. It was noted that Jonah crab and snow crab don't appear to occur in the same areas, but the survey did get some snow crab mixed in with sea urchins, sea cucumbers and shrimp. Often the catch was either male or female dominated. The biggest tow was about 300 pounds.

Reviewer's Comments

It was suggested that Tow-Cam could be utilized during the survey, but it was felt that this would be far too time consuming.

Questions were asked about the length-weight measurements, particularly about how they were used and whether they had been incorporated as an indicator fairly recently or for a long time. It was noted that, in the past, individual animals weren't weighed. This practice started in 2004. A condition index may be valuable. Maturity is accompanied by a widening of the abdomen, with a

corresponding increase in weight. This may be an indicator of fecundity, which is not currently estimated.

The length of the survey was considered to be an issue. For example, it is possible to get changes in the catch rates of shrimp during the shrimp survey due to vertical migration. Over such a long survey time, there would be changes in the day length. It was asked whether, when the survey is designed, attention is paid to the sequence of stations to account for potential changes in catch rates over time. It was noted that there is no repeated sampling to investigate this effect. Snow crab have diurnal patterns with activity but not catchability. The survey is such that it was felt it would be hard for a snow crab to avoid. Sampling issues are typically size related. This sampling method was inherited. It was suggested that this issue would be hard to address even using a repeated sampling approach. It was clarified that the sampling efficiency for the gear was estimated to be 1. This has yet to be tested.

It was asked whether there were any larval tows for crab. While there are no directed larval tows for snow crab, there are some larval survey being conducted in Lobster Fishing Area 31A, which may also be identifying crab larvae. Larvae stages were not identified, however, as the expertise of how to do so was not available at the time. Some samples were taken back to the Bedford Institute of Oceanography for study.

General Discussion

Clarification was sought on what was recorded during the survey and how. It was noted that pictures were taken of everything that comes on board.

It was also clarified that the survey is conducted before the 4X fishery.

Questions were asked about the criteria that are used to conduct more stations. It was noted that a few more stations were added this year to investigate whether benefits are gained in increased precision or accuracy if you increase the number of stations. Analysis will be done this year. In general, however, the same stations are done each year.

It was asked whether, if there is a big rock caught in the survey, whether it is considered to be a failed set. It was felt that if a large rock went into the net first, it might prevent other crab from going in. It was clarified that the station is only redone if the net is damaged. There are 3 nets on board, so they can be replaced if they are damaged. If all 3 nets are damaged, the survey may be delayed for a few hours.

It was suggested that a Remotely Operated Vehicle (ROV) should be used to view the bottom habitat characteristics when a high density of snow crab is noted at a survey station. It was explained that, while an ROV has been technically available for a whole year, it has been in the shop the whole time.

Integrated Assessment

Working Paper: Integrated Assessment of the Snow Crab Resident on the Scotian Shelf in 2007. CSA Working Paper 2008/03.

Presenter: J. Choi
Rapporteur: P. Kuhn / T. Worcester

Presentation Highlights/Abstract

The life-history characteristics of snow crab, including a life-cycle diagram and information on the growth of instars, was presented. Information of predators, prey, competitors, and other ecosystem interactions was also provided. Details can be found in the research document (Choi et al., 2008).

A description of the habitat index was provided. It is possible to estimate the surface area of the Crab Fishing Areas that has an average bottom temperature of 0-6 degrees. The habitat for snow crab in N-ENS appears to be very stable. S-ENS is more dynamic, with the average steady now but with larger temperature fluctuations in the past. 4X is the most variable. The temperature pattern is similar between N-ENS and S-ENS except that is generally cooler in N-ENS. There appears to be temperature fluctuation in 4X, on 4 year cycle.

Berried females abundance is increasing rapidly in all areas. There are more virgin female snow crab in CFA 23. Instar 8 (immature snow crab) were found primarily inshore. Instar 9 (immature) were found inshore but over a broader area. There were few instar 10, as most have already become mature at this point. There is a 10 year cycle of female generation. Sex ratios are improving such that there is now almost a 1:1 ratio. In 2000-2004, there was low larval production and low numbers of females.

Abundance increased by 28% in N-ENS and 47% in S-ENS. It's about the same in 4X. Improvements are likely seen in S-ENS because of good soft-shell practices and the returning immature crab. Recruitment is flat in N-ENS, getting better in S-ENS, and highly variable in 4X. In N-ENS, females are probably mating with small, dwarf crab (no large males during mating for past 2-3 years). Carapace Condition 5 (CC5) snow crab are used as an indicator of total mortality.

Fishing mortality was 19% in N-ENS, 10% in S-ENS, and 23% in 4X. An increase in snow crab is expected over the next 4 years given reasonable fishing strategies in S-ENS, N-ENS, and 4X. Fishing mortality in the range of 10-30% is likely sustainable in S-ENS and 4X, while fishing mortality of 10-20% is likely to be sustainable in N-ENS.

The outlook for N-ENS in the short term (5-years) is positive, but it a cautious approach and a lowering of the TAC is recommended given the soft-shelled crab issue. In S-ENS, the short and medium term outlook is very positive, and there is a good soft shell protocol in place. A moderate TAC is recommended. In 4X, the short term outlook is uncertain but the medium term outlook is positive. There is much environmental variability in this area, and there appears to be movement between S-ENS. A cautious approach and a lower TAC (to a status quo) is recommended.

Reviewer's Comments

Reviewers felt that the terms of reference for the meeting had generally been addressed, and many of the recommendations from last year had been considered. The by-catch analysis is new, which is good to see.

There was discussion about the Kriging technique that had been used (e.g., whether external drift had been used) and how estimate error was highest along the edges of the survey where data is more sparse. It was noted that external drift doesn't change abundance but changes the location of abundance. It was also noted that this approach had been tried in the Gulf Region. There was some criticism regarding the use of this more complex method, as well as discussion of variograms, masks (e.g., buffers around survey stations, influence of temperature and depth), and survey catchability. It was asked whether there was enough survey data to estimate mortality. However, it was felt that with only 3-4 years of data that is was too early to provide reliable estimates. It was suggested that standardized and unstandarized results could be compared to better see what was being done to the data.

There was some discussion about what was driving the cycles of recruitment, which are also seen in shrimp. It was noted that some work is being done to estimate egg production.

Remarks were made that it was interesting to see that there appears to have been a biological response to advice and management. The effects of good handling practices in S-ENS and controls in NENS and 4X appear to be paying off. It was asked whether any additional advice could be provided. However, it was suggested that any additional numbers would be somewhat arbitrary, and that the fishermen were the primary stewards of the resource. Fundamentally, the life-stage that is being targeted is a small proportion of the total population. Based on biology alone, what can be sustained is approximately 20-30%. What needs to be considered at the same time is that the ability of large males to mate should not be damaged.

Discussion

There was a suggestion to add the life-cycle diagram to the Research Document. This has been suggested also at previous meetings.

Questions were asked about the apparent "explosion" in females. It was noted that this increase in females was the result of the recruitment pulse that has been tracked previously.

Questions were also asked about how primary production and nutrients (e.g., nitrates) might be related to the abundance of snow crab. This type of analysis has not been attempted. There has been a long-term tracking of primary productivity based on chlorophyll. There has also been an increase in nitrates over time, but the data on this is spotty.

It was asked whether the fishery will continue in a cyclical nature, or if pulses will be replaced by a more even-level of recruitment. The answer to this question isn't known, but the last pulse can be related to the ground fishery collapse. Hopefully recruitment will even out.

The possibility of males hatching in the north now developing into dwarf males was discussed. There was some concern expressed about seeing an abundance of dwarf males in the future, and it was suggested that this should be investigated further. Also, there were questions about what stage crab is required to mate with the female crab. It was clarified that the dominant male is a stage 3 crab, as the stage 2 shells are still easily broken. Additionally, maintaining a

1:1 ratio is not necessary. Female snow crab can store sperm and use it over a 3-4 year period. In general, there has been a predominance of male crab that are mature on the outer part of the shelf, with females more inshore.

There was dialogue about having an earlier season to avoid soft shells, and about how to convey to fishermen the importance of good handling practices. The soft-shell crab issue is not just a short-term issue if damage is done to smaller crabs. It was asked why there seemed to be less concern from the management side this year with respect to the high soft-shell catches in the north. It was noted that a shorter season would be better, especially when soft shells are an issue. Most damage occurs in the later part of the season. If the fisheries can agree to a season duration that is reasonable, that would be the best way to proceed.

There was discussion about how large an increase in TAC should be taken in S-ENS (i.e., what exploitation rate to adopt in S-ENS). Advice was given to make small incremental increases rather than one large increase. It was noted that the proposed 20% exploitation rate was for the whole area. If the TAC was caught all in one area, there could be local depletion. Distribution of effort was an important consideration. It was noted that a larger quota might provide incentive to fish further offshore (slope). However, it was felt by industry that the warmer slope water led to greater barnacle growth, and the buyers didn't like the barnacles.

Questions were asked about whether reference points would likely be established in the near future. The precautionary approach (PA) was not felt to be very straight-forward for snow crab and other invertebrates, and perhaps DFO's PA framework was not the best one to use for snow crab.

A question was asked about whether recruitment occurred on the slope edge, and it was clarified that it does. There was then some discussion about whether or not to include slope animals in the biomass estimate. In the end, the consensus was to keep them included as they are part of the breeding population and do migrate.

There was some discussion of seismic impacts on snow crab. There is lots of information on snow crab, even in areas where seismic has occurred. It was asked whether this information could be used to reduce uncertainty about potential impacts. The usefulness of a retrospective analysis was questioned. However, controlled test studies were considered to be a possibility. A very controlled experiment would be required.

CONCLUSIONS AND RECOMMENDATIONS

Oceanography

In 2008, air temperature was close to climatology in annual average. Wind stress was slightly above the norm, and generally more northerly. There was generally less ice. It was generally colder than average, but warmer in the north compared to 2007. There may be greater stratification. Habitat indices (0-6 and 0-3) both showed greater area of habitat this year. Snow crab were generally caught in colder water than in 2006. Temperature data continues to be collected with the minilog sensors, and people were encouraged to use and return them. An index of larval transport was suggested. And it was agreed that the oceanographic information should be included in a working paper for next year. In addition, a comparison of minilog temperatures to last year where fishing occurred in same location was recommended, as was further investigation of FSRS inshore data.

Fishery

In 2008, catch rates were higher in CFA 23 and 24; similar in 4X; and lower in N-ENS. Effort shifted offshore in N-ENS and S-ENS, except CFA 23, and 4X was similar to 2006. There was less than intended observer coverage. There was lots of soft shell crab caught in E-NS, less in Areas 23/24, and none in 4X due to the different season.

Joint Protect Agreement

In 2008, there was good contribution to the JPA in CFA 23. Contributions were ok in CFA 24, less in 4X, and really poor in CFAs 20-22. If fisheries were ok with the JPA this year, it would make it easier to extend the contract for next year. If there are concerns, it would be best to wait until the discussion at the advisory meeting where new contracts would be discussed. It was noted that the fisheries wanted to know who hadn't made their contributions. People were encouraged to contribute, otherwise science and the ability to manage the fishery would likely suffer.

Survey

The 2008 survey was generally similar to 2007 but with a few extra stations to determine whether this would help with precision. Pictures were taken of all catch, but not of the bottom. The ROV was in the shop and could not be used. Further exploration of length-weight relationships was recommended, as were fecundity estimates. There was some concern expressed about the influence of survey duration on the distribution of snow crab and, thus, accuracy of the survey results. There were also some questions about gear efficiency. Some interest was expressed in conducting larval tows, which are done for lobster inshore. Other sources of larval information, such as the AZMP, were suggested.

Assessment

A wide variety of information on life-history and growth, predators, prey and competition, and other ecosystem interactions were presented. This was all summarized in a "traffic-light" table, to provide context for the other assessment indicators. The habitat index in NENS was stable, SENS less so, and in 4X, very variable (4 year cycle). In general, the increase in berried females resulting from good recruitment 10 years ago (10 year cycle) has help to created positive conditions for snow crab in 2009 and likely in the coming years. There was significant

discussion about how to treat the slope areas in the assessment, as well as how to determine a sustainable exploitation rate in each area given the level of uncertainty in the predictions and changing environmental conditions.

NEXT STEPS

The Science Advisory Report would be revised, edited at an editorial meeting, and published to the Canadian Science Advisory Secretariat (CSAS) website as soon as possible.

The working paper was accepted, and it would be published as a Research Document.

The proceedings of the meeting would be prepared at some later date and posted to the CSAS website.

REFERENCES

Choi, J.S., B.M. Zisserson and P. Kuhn. 2008. Integrated Assessment of the Snow Crab Resident on the Scotian Shelf in 2007. DFO Can. Sci. Advis. Sec. Res. Doc. 2008/012.

Appendix 1. List of Participants

Science Advisory Process on Assessment for
Atlantic Nova Scotia Snow Crab

26 – 27 February 2008

Mic Mac Amateur Aquatic Club
192 Prince Albert Road
Dartmouth, Nova Scotia

ATTENDEES

Name	Affiliation
Anderson, Bob	CFA 24 (S-ENS)
Baker Stevens, Nellie	CFA 24 (S-ENS)
Basque, Anita	Chapel Island First Nation
Boudreau, Ginny	CFA 24 (S-ENS)
Brickman, Dave	DFO Maritimes / OSD
Cashin, Cecil	CFA 24 (S-ENS)
Choi, Jae	DFO Maritimes / PED
Cormier, Paul	N-ENS
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Gentile, Paul	DFO Maritimes / FAM
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Kehoe, Paul	CFA 24 (S-ENS)
Koeller, Peter	DFO Maritimes / PED
Kuhn, Penny	DFO Maritimes / PED
MacDonald, Gordon	CFA 23 (S-ENS)
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MacLeod, Kenneth	CFA 23 (S-ENS)
Martin, Tim	Native Council of Nova Scotia (NCNS)
Matthews, Paula	DFO Maritimes / CDD

Name	Affiliation
McCormick, Shannon	DFO Maritimes / CDD
McIntyre, Tara	DFO Maritimes / PED
Nash, Herb	CFA 23 (S-ENS)
Nash, Kevin	CFA 24 (S-ENS)
Organ, Greg	N-ENS
Rideout, Murray	CFA 21 (N-ENS)
Risser, Junior	CFA 4X
Roddick, Dale	DFO Maritimes / PED
Showell, Mark	DFO Maritimes / CSA
Stevens, Clark	CFA 24 (S-ENS)
Sweeney, Anne	DFO Maritimes / SWNS
Walmsley, Danny	Offshore Energy Environmental Research (OEER)
Whitelaw, Jeff	CFA 23 (S-ENS)
Whynot, Larry	Native Council of Nova Scotia (NCNS)
Worcester, Tana (CHAIR)	DFO Maritimes / CSA
Zisserson, Ben	DFO Maritimes / PED

Appendix 2. Terms of Reference

Science Advisory Process on Assessment for
Atlantic Nova Scotia Snow Crab

26 – 27 February 2008

Mic Mac Amateur Aquatic Club
192 Prince Albert Road
Dartmouth, Nova Scotia

TERMS OF REFERENCE

Context

The snow crab fishery on the Atlantic Scotian Shelf occurs annually throughout the year, dependent upon the Crab Fishing Area (CFA). In support of the fishery, DFO Maritimes Fisheries & Aquaculture Management Branch requests Science Branch for an assessment of resource status and the consequences of various harvest levels for the coming fishing season. The current meeting is a scientific review of the assessment and projections undertaken in support of the 2008 fishery.

Objectives

- Assess the status of Atlantic Nova Scotia's CFA's snow crab up to the end of 2007, using the following indicators:
  - Abundance
    - Snow crab survey biomass index of males greater than 95 cm (commercial sizes)
  - Recruitment
    - Snow crab survey R-1 relative abundance
  - Exploitation Rate
    - Incidence of CC5 crab in the survey
    - Relative exploitation rate from the survey
  - Report on
    - Commercial catch rates in the 2007 fishery, compared to those in previous years
    - Abundance of female crab from the survey

- Evaluate the consequences of different harvest levels during the 2008 fishery on stock abundance and exploitation rate.

- Estimate by-catch of non-snow crab species from the past three fishing seasons.

Outputs

CSAS Science Advisory Report for Atlantic Nova Scotia CFA's
CSAS Proceedings summarizing the discussion
CSAS Research Document

Participation

DFO Science Maritimes and Gulf Regions
DFO Maritimes Fisheries and Aquaculture Management
Provincial Government representatives
Industry
External reviewers

Appendix 3. Agenda

Science Advisory Process on Assessment for
Atlantic Nova Scotia Snow Crab

26-27 February 2008

Mic Mac Amateur Aquatic Club
192 Prince Albert Road
Dartmouth, Nova Scotia

DRAFT AGENDA

26 February 2008 - Tuesday

08:30–09:00	Welcome and Introduction (Chair)
09:00–09:45	Oceanographic Overview (D. Brickman)
09:45–10:15	The Fishery (B. Zisserson)
10:15–10:30	Health Break
10:30–10:45	2007 Snow Crab Survey (B. Zisserson)
10:45–11:00	Snow Crab JPA (T. MacIntyre)
11:00–12:30	Eastern Nova Scotia CFA's (J. Choi)
12:30–14:00	Lunch
14:00–15:00	Examination by Referees (Chair)
15:00–15:15	Health Break
15:15–16:30	General Discussion (Chair)

27 February 2008 - Wednesday

09:00–10:00	Review of Science Advisory Report (Chair)
10:00–10:15	Health Break
10:15–12:00	Review of Science Advisory Report (Chair)
12:00 noon	Adjournment (Chair)